Controlling Molecular Assembly and Optical Properties of Organic Thin Films by Rational Design

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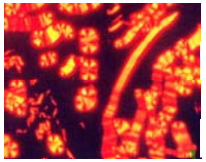
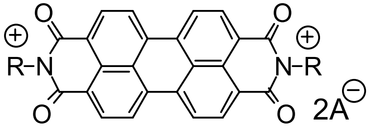
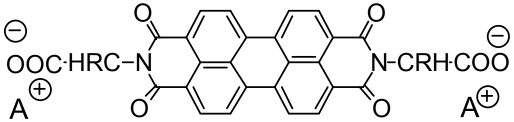
This research strives to understand the structural factors governing the self-organization of organic compounds (in particular compounds that absorb and emit visible and near infrared light) into solvent-dependent liquid-crystalline phases. Many useful materials and devices that we take for granted today depend on the self-organizing properties of organic compounds into a liquid-crystalline phase in the manufacturing process or in the functioning of the device. An important example is liquid crystal display. A further understanding of the structure-property relationship of liquid-crystalline compounds is important for designing novel liquid-crystalline materials, optimizing properties, and developing new applications.



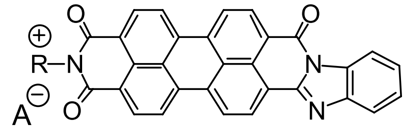


1a: R=$(CH_2)_2NHEt_2$, A=Cl
1b: R=$(CH_2)_2NMeEt_2$, A= 4-$MePhSO_3$

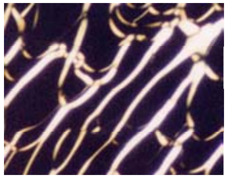


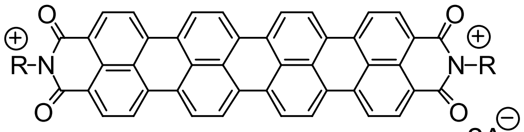
QuickTime™ and a Photo - JPEG decompressor are needed to see this picture.

2: R=$CH_2CH(CH_3)_2$, A=K

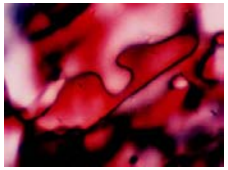


3: R=$(CH_2)_2NHEt_2$, A=HCOO





4: R=$CH_2CH_2NHEt_2$, A=HCOO



Optical photomicrographs of the liquid-crystalline samples of compounds **1-4** when viewed between crossed polarizers.

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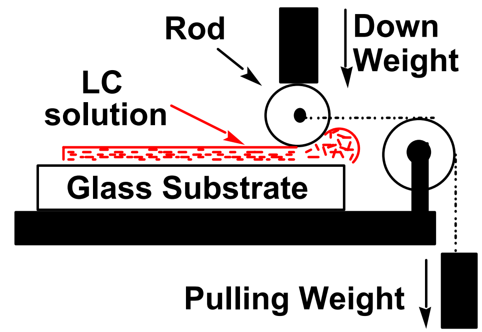
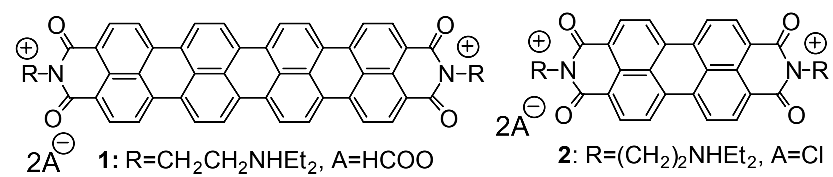
Another important endeavor of this research is to control the molecular orientation of organic compounds in the solid state generating anisotropic (direction-dependent) ordered materials that linearly polarize light. Important applications of dichroic and fluorescence polarizers include liquid crystal displays, fluorescence polarization sensors, sunglasses, and antiglare screens.

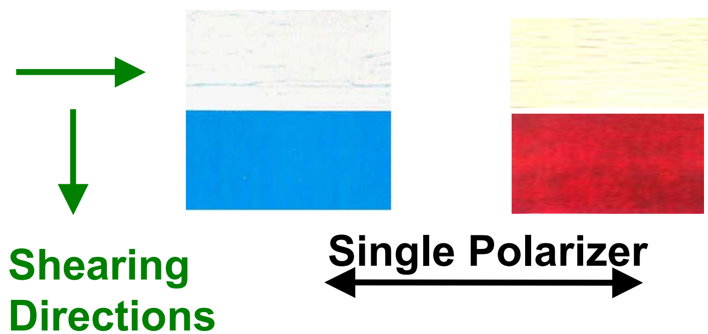
Education: This integrated teaching and research program introduces students to the basic knowledge and techniques for studying organic materials. In addition, it provides training to four undergraduate and seven graduate students (including underrepresented groups) preparing them for careers that may include organic materials research and improving their access to a teaching career in science.





1: R=$CH_2CH_2NHEt_2$, A=HCOO

2: R=$(CH_2)_2NHEt_2$, A=Cl



Control the molecular orientation of organic compounds in the solid state generating anisotropic (direction-dependent) ordered materials that linearly polarize light.